slip occurs in the frozen soil of the Siberian coast, which never thaws, even during the greatest heat of the summer, to a depth of more than 2 feet; and in this way, within a period of a century and a half, five or six of these curious corpses have come to light from their icy graves.—*From a Report by Mr. Lumley, H.M. Secretary of Embassy and Legation, Russia*, 1867.

On the union of the Tympanic Bone with the Lower Jaw occurring in the Marsupials during development, as a fresh proof of the agreement of this bone with the os quadratum *of the other classes of Vertebrata.* By Professor W. Peters.

The articulation of the lower jaw in the Mammalia is effected, as is well known, by means of a condyle, which fits into an articular cavity of the zygomatic process of the temporal bone, either directly or by the mediation of an interarticular cartilage, whilst in the other classes of Vertebrata the lower jaw is united, by means of an articular cavity, with the condyle of a bone which, after Hérissant's example, is usually called the *os quadratum*.

This bone is either articulated to the cranium (Birds, Lizards, Snakes), or united to it by suture (Crocodiles, Tortoises, Batrachia). In the former case it *may* assist in the formation of the tympanic cavity and in the attachment of the tympanic membrane; in the second it always does so. This bone may be united to various parts of the temporal bone, and to the pterygoid, sphenoid, and occipital bones. Of all these unions, that with the temporal bone, and, indeed, with its squamous portion, is alone constant, whilst all the others may be wanting.

The question, with what part of the mammalian skull the quadrate bone is homologous, has given rise to many disputes, and has been answered in various ways:—

1. Hérissant regarded the ascending ramus of the lower jaw as the part corresponding to it.

2. Tiedemann, Platner, and apparently Köstlin regard the quadrate bone as a part separated from the squamous (and petrous) portion of the temporal.

3. Geoffroy St.-Hilaire regarded the *os tympanicum* with the *processus styloideus* as representing it.

4. Oken, Cuvier, Blainville, Spix, Meckel, Carus, R. Wagner, Hallmann, Stannius, Owen, and others interpret it as the *os tympanicum*.

5. Reichert, O. Schmidt, and Huxley declare that, as Carus had previously supposed, the incus or the middle ossicle of the ear in the Mammalia is the quadrate bone of the other Vertebrata.

I had hitherto adhered to the opinion that the *os tympanicum* of the Mammalia was homologous with the *os quadratum* of the other Vertebrata, as also used originally to be indicated by J. Müller, in his lectures, whilst subsequently he used the expression "quadrate bone." To me the proof of this interpretation lay in the similar position of the bone in its relations to the tympanic cavity and membrane, and in the union of the bone with the sphenoid occurring

even in the Marsupialia. The absence of the articulation with the lower jaw seemed to me to be of the less importance, as the quadrate bone is also inconstant in its other unions, and only that with the squamous portion of the temporal is constant. That a distinct bone, which is constant throughout the whole series of the Mammalia, should at once disappear, seemed to me to be improbable; nor could I accept the small fragments of bone found in birds, by some observers, as representing it.

I could never reconcile myself to the opinion, supported especially by Reichert and Huxley, that the incus of the Mammalia is the homologue of the quadrate bone, both on account of the objections raised against it by J. Müller*, who had the opportunity of carefully examining the preparations made by M. Reichert for the proof of his opinion, and also because it seemed to me very improbable that the incus, which in the *Ornithorhynchus* does not occur at all, or only appears as a minute rudiment, should suddenly make its appearance again in the Birds in such gigantic proportions and in a totally different position, not to mention the difficulty of interpreting the incus and malleus which certainly likewise occur in a cartilaginous rudimentary state in Birds†.

Leaving this last circumstance, especially, out of consideration, from the similarity which two parts issuing from or connected with Meckel's process (namely, the articular portion of the lower jaw in Birds and Amphibia, and the malleus of the Mammalia lying behind the lower jaw) present to one another at a certain period of development, a conclusion is arrived at as to the homology of these parts, upon which a number of other hypotheses upon the homologies of other parts of the skeleton (*e. g.* in the fishes) are supported; and the latter, of course, fall if the former be erroneous.

At the present moment, when I am occupied with the conclusion of other investigations, I should hardly have been led to take up again a question which has been so long in dispute, if Mr. Huxley, who had already ‡ given his decided adhesion to the opinion of the homology of the quadrate bone and the incus, had not, in a memoir upon the classification of Birds, otherwise containing much that is admirable, and which is destined to find a very large circle of readers, represented the matter as if all doubt upon the point in question had been got rid of §.

As it appeared to me that a solution of the question was most likely to be found among the lower Mammalia, which approach Birds in so many respects, I first sought for it among the Monotremata, but have been compelled to interrupt this investigation for the present, and in the next place took young Marsupials in hand.

* Archiv für Anatomie und Physiologie, 1838, p. clxxxvii.

† Even if there may be some doubt with regard to the incus in Birds, this must be quite baseless with respect to the malleus. But the bone which is denominated incus in the Mammalia is always situated between the stapes and the malleus.

‡ Lectures on the Elements of Comparative Anatomy. London, 1864, pp. 229 *et seq.*

§ Proc. Zool. Soc. London, 1867, p. 416.

In a young *Halmaturus Bennettii*, measuring (without the tail) 85 millims., the *os tympanicum* forms a ring broken through before and behind, just as in the developed state in the Monotremata. The anterior and stronger part of this ring divides into a fork above, and embraces Meckel's process from without and behind, whilst beneath it fits exactly with a convexity upon the inner surface of the ascending portion of the lower jaw, and with a smooth articular surface into the upper concave surface of the incurved angle of the jaw.

I find the conditions exactly similar in older examples of *Didelphys aurita*, only that the tympanic bone is already separated by a thin layer of connective tissue from the angle of the lower jaw.

From this the peculiar characteristic formation of the angle of the lower jaw in the lower Mammalia is at once explained; its inwardly projecting portion corresponds, as a provisional articular process, with the permanent inner articular process of Birds.

It is possible, and appears to me even probable, that the malleus in Birds contributes to the formation of the quadrate bone, as in Birds there is still a second outer articular cavity, no part corresponding to which exists in the Marsupialia. This will probably find its explanation among the Monotremata, as in *Ornithorhynchus* a peculiar external process of the lower jaw occurs, corresponding in position to the outer articular process in Birds; and I hope soon to be able to make further communications upon this point.—*Monatsber. Berl. Akad. der Wiss.* Nov. 21, 1867, pp. 725–729.

On the Tympanic Bone and Ossicles of the Ear in the Monotremata, in connexion with the question of the interpretation of the Quadrate Bone in Birds. By Professor W. Peters.

My hope of obtaining very young Monotremes, and by their investigation solving, as I expected, the question of the homology of the quadrate bone of birds with the tympanic bone, has not been fulfilled; but yet, from the examination of a not completely developed skull of *Tachyglossus hystrix*, for which I am indebted to the kindness of Dr. Möbius, and from that of a still younger skull of *Ornithorhynchus* belonging to the Zoological Museum of Berlin, some results have been obtained which seem to me worth communicating.

The *os tympanicum* of *Tachyglossus* is, indeed, at a later period amalgamated with the long process of the malleus, but the boundary between them may still be distinctly recognized. It then forms a half ring, the thinnest middle part of which is applied directly to the *os pterygoideum*, and at the spot which lies nearest to the apex of the long process of the malleus it is but little widened. But in the young specimen now before me, this entire region is the broadest of the ring, and moreover it is furnished on its lower free surface with a slight convexity, which corresponds to the inner concavity of the small angle of the lower jaw, and which, in all probability, and judging from the conditions in the Marsupials, was previously united like a joint with this cavity. The extraordinary size of the long process of the malleus is likewise remarkable; in proportion to the